AAAC meeting, Jan 26, 2023

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NSF MPS/AST DD

1. Updates on NSF Facilities
2. Progress responding to Astro2020

The Arecibo Observatory

November	2020	Plan to decommission the 305-meter due to safety concerns
December	2020	The 305-m telescope platform collapsed
January	2022	National Academies committee begins study regarding Causes of Failure and Collapse
March	2022	Emergency Cleanup complete; Science and Visitor's Center reopened ~2 years of shutdown
August	2022	Thornton Tomasetti Forensic Investigation complete
October	2022	The Arecibo Center for STEM Education and Research (ACSER) solicitation released: NSF 23-505

The proposed re-imagined Center would have a significant role in modeling and advancing equitable and inclusive STEM education and research, especially in Puerto Rico and for individuals and communities underrepresented in STEM

https://www.nsf.gov/news/special_reports/arecibo/

Kitt Peak Contreras Fire

- **Power**: Main power reinstated
- **Internet**: fiber installed
- **Operations**: Mayall 4.0-m and WIYN 3.5-m telescopes have been operating, with some time lost periodically because of power issues.
- **Summit Access**: the road is open to observatory staff but will remain closed to the public through the winter.

ALMA suffered a cyberattack on 29 October, forcing the suspension of astronomical observations.

The attack was contained, and no science data or antennas were compromised.

ALMA Successfully Restarted Observations

After 48 days, the Atacama Large Millimeter/submillimeter Array (ALMA) is observing the sky.

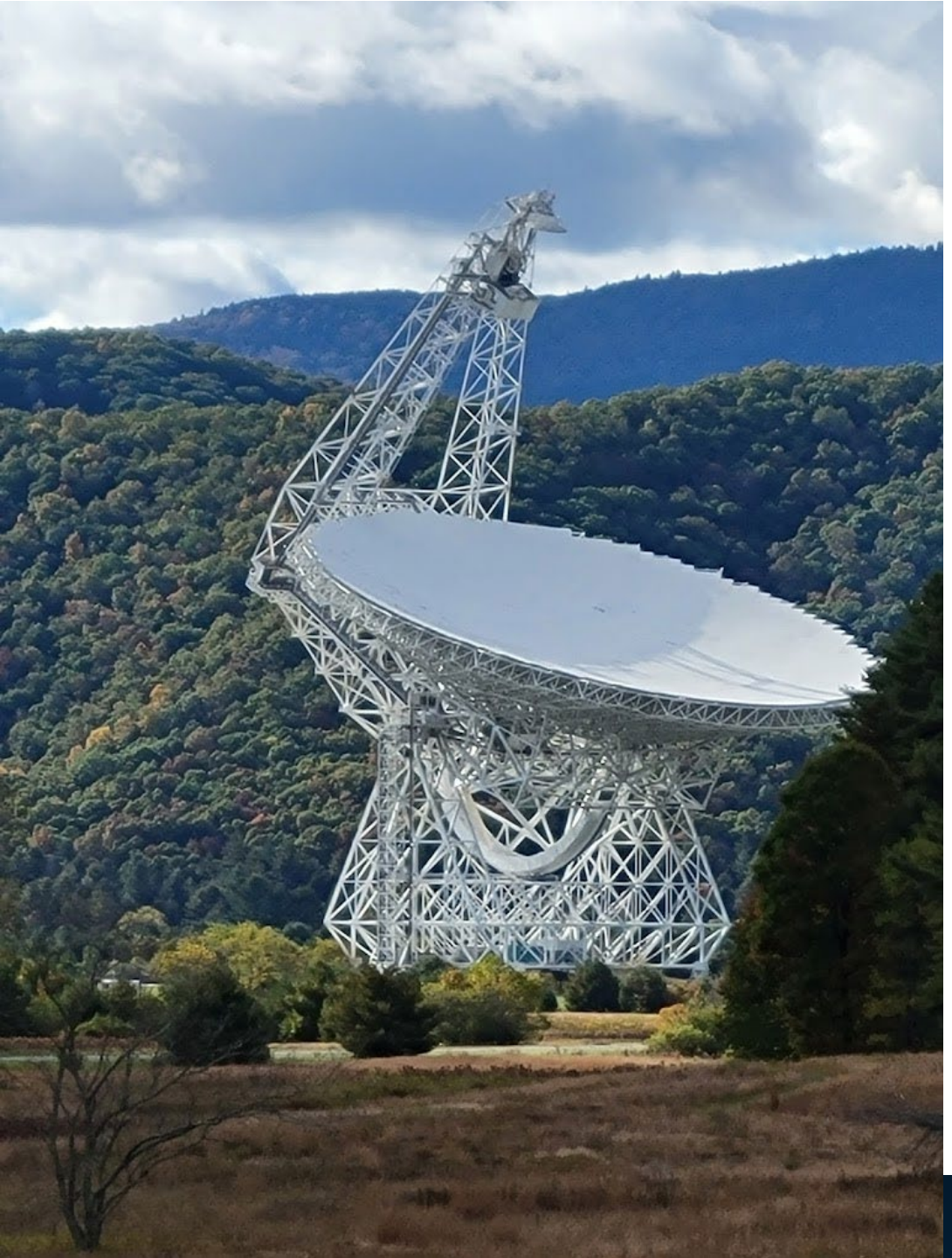
The computing staff has worked diligently to rebuild the affected JAO computer system servers and services.

Gemini-N Primary Mirror Incident

- Oct 20, 2022, the Gemini-North primary mirror suffered damage during recoating activities. No-one was injured during this accident.
- The damaged area of the mirror is outside the clear aperture used for observations. Team is working to ensure that Gemini-N is returned to normal science operations in late March/early April.
- Updates are being posted on the Gemini website,

Maunaloa volcanic eruption

- NSO GONG station closed, not impacting Maunakea telescopes at this time.

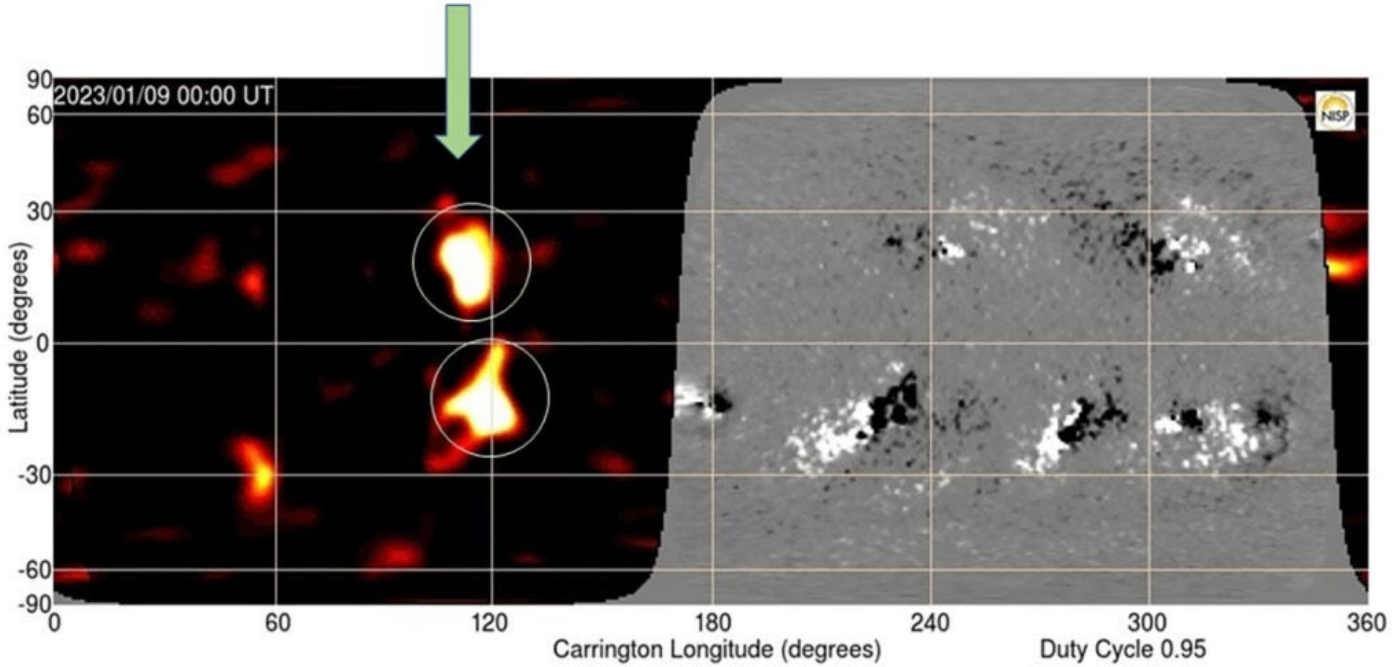


Green Bank Telescope

During routine maintenance on the Green Bank Telescope (GBT), an azimuth wheel was found to have suffered a significant failure.

Out of an abundance of caution and safety, the GBT has been taken offline for repair. The current estimate for downtime is 6 weeks.

NSF's National Solar Observatory



Scientists detect active regions on the unseen, far side of the Sun using a technique known as helioseismic holography. Solar activity will remain high throughout the next couple of weeks with a pair of significantly large active regions returning to view this weekend.

Progress on Astro2020 recommendations

Recommendations: Develop the Workforce

Increase funding incentives for improving diversity.

Pipeline transitions are loss points that should be addressed.

Provide undergrad and graduate "traineeship" funding for professional workforce development.

Support independent postdoctoral fellowships.

Workforce Development

		Description
AST	**PAARE**	AST: Partnerships in Astronomy & Astrophysics Research and Education
	REU	AST: Research Experience for Undergraduates
	AAPF	Astronomy & Astrophysics Postdoctoral Fellows
MPS	**ASCEND**	MPS: postdocs with potential to broaden participation
	LEAPS	MPS: early career faculty at institutions with little NSF STEM funding
NSF	**GRFP**	NSF: Graduate Student Research Fellowships Program
	CAREER	NSF: faculty early career development for leadership
	GRANTED	NSF: Growing Research Access

Natalie Nicole Sanchez

Raquel Martinez

Aaron Stemo

Erin Cox

Recommendations: Collect and Report Demographic Data

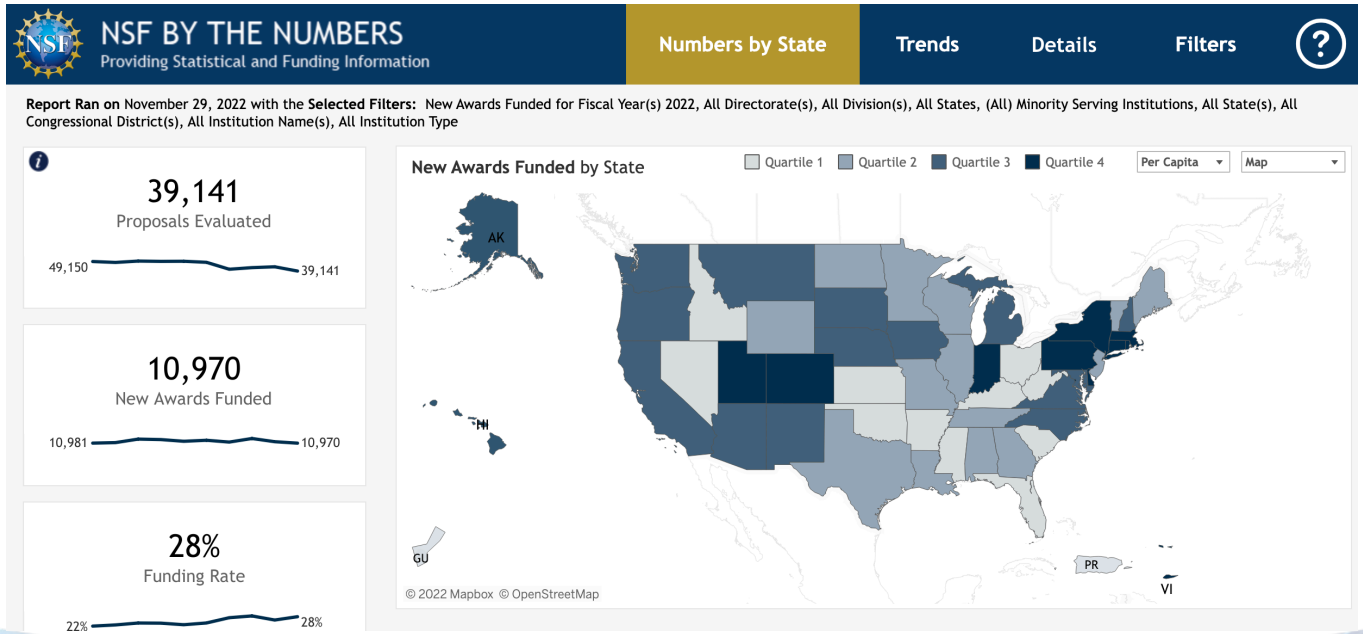
Ensure that scientific integrity policies address harassment and discrimination as forms of research/scientific misconduct.

Collect and report demographic data pertaining to proposal competitions.

NSF (and NASA and DOE) should release data on proposal success rates on annual basis

NSF By the Numbers: web interface to Tableau data visualizations.

- Information is aggregated for all of NSF, and can be resolved by Directorate (e.g., MPS)
- Working on how far down this can be divided before identifiable information released.
- There is missing context and some nuance that is important for small number statistics (e.g., no “Return Without Review” or holds on declines)



Recommendations: More funding for individual investigator research

NSF should increase funding for AAG by 30% in real dollars b/t 2023 – 2028 and increase MSIP to $50M/yr

Increase midscale funding with a target of reaching $50M / year for MSIP

1. *Restore grants health: increase funding for grants by 30%, Midscale Innovations Partnerships (MSIP) to $50M / year, double Advanced Technology and Instrumentation (ATI).*
2. *Coordinate and invest in data management.*

Challenging to balance – implementing senior reviews. Compete for NSF-wide MRI, Midscale-1, Midscale-2.

Workshops on Data Management (Feb 2023) and Centers of excellence. Both have potential broad partnerships.

Recommendations: Support laboratory astrophysics

Supporting laboratory data to interpret results from new generation of astronomical observatories.

- Program officers from NSF and NASA working together.
- Task force chartered through the AAAC; invitation to TF members.
- Planning for a first meeting of the TF during the January 2023 AAAC meeting.

Recommendations: plan for operations and management of facilities

The addition of new MREFC facilities should be contingent on implementation of a sustainable plan for O&M.

- Important recommendation (NSB 2018 report recommended developing a plan for operations and management).
- This would apply to facilities NSF-wide (much bigger than just AST).
- Do not yet have a silver bullet, but this is on our radar.

Recommendations: Community Portfolio reviews

NSF should establish a regular cadence of reviews of the AST portfolio.

- We are investigating the senior review model for NSF facilities.
- Planning a “committee of visitors” meeting in Fall 2023.

Recommendations: Protect the Skies

Work with federal regulatory agencies to develop a regulatory framework to control impacts of satellite constellations on optical and radio astronomy.

RADIO:

SpaceX will meet international standards for the protection of the radio astronomy band from 10.6 - 10.7 GHz. Further commitment to dynamically enable radio astronomy, avoiding main beam illumination of the VLA, VLBA, GBO, AO and geodetic VLBI stations

OPTICAL:

Reduce optical brightness to 7th mag or fainter, maintain elevations at 700km or lower, provide orbital information. Developing a new dielectric mirror film that reduces brightness and make available to other satellite operators. AO lasers at ground-based observatories will no longer have to shutter when SpaceX satellites pass by – opting out of Laser Clearinghouse protection.

Recommendations: Reduce greenhouse gas emissions associated with research

Increase remote observing, hybrid conferences to reduce travel impact on carbon emissions

NSF is providing funding to make G-S carbon neutral with PV arrays and battery backup in the next few years.

NOIRLab is working to reduce the GHG emissions by ~50% in the next few years (infrastructure upgrades).

Requiring new section on climate impact for major facility proposals.

Working with all facility directors to get estimates of energy use, carbon emissions, and possible renewable power.

Recommendations: Build Game-changing new major facilities

At least one and ideally two Extremely Large Telescopes (GMT and TMT) with a target level of at least 25% of the time on each telescope.

NSF and DOE should pursue ground-based CMB experiment (CMB-S4).

The NSF should proceed with the next generation very large array."

Progress on Facility Recommendations – putting all into the major facility infrastructure design phase to understand NSF scope.

1

ELTs: **NSF Preliminary Design Review** underway; NSF beginning studies of Environmental and Cultural impact Studies.

2a

CMB-S4 team is developing alternative designs to understand infrastructure footprints at South Pole. Regular engagement with DOE, OPP, and the team. Submitting request for consideration to enter NSF Conceptual Design Phase.

2b

ngVLA prototype antenna completed. Submitting request for consideration for NSF Conceptual Design Phase.

Status of Maunakea and TMT

- Maunakea Stewardship and Oversight Authority (MKSOA): 11 members representing a broad range of interests and expertise including the traditions and culture of Native Hawaiians (NH).
- NSF is committed to working with the MKSOA and have been engaging:
  - MPS/AST met at ‘Imiloa Hawaiian Cultural Center (May 2022)
  - NSF EIS informational meetings occurred on the Big Island (Aug 2022)
  - Director Panchanathan met NH at DKIST inauguration (Aug 2022)
  - MPS AD Sean Jones attended Community Workshop (Seattle Jan 5-6)
  - We met with NH representatives (Seattle 1/10) regarding path forward
- No matter what happens with a TMT partnership, NSF looks forward to finding ways to improve STEM opportunities for Native Hawaiians.

Astro2020 recommendation for 30-m class telescopes
The competition: 39-m European-Extremely Large Telescope (E-ELT)

The E-ELT construction: Nov 2022

E-ELT illustration (est 2029)

The US-ELT system would equal or surpass E-ELT capability. Together the collecting area of GMT+TMT equals the E-ELT with important advantages:

- All-sky access, better time-domain capability
- Fewer opto-mechanical engineering challenges relative to E-ELT
- Two telescopes double the instrument suite for greater scientific leverage

GMT construction site: 2022

24-m GMT illustration (est 2035)

30-m TMT illustration (est 2035)

Astronomical observatories advance physics, chemistry, atmospheric science, and potentially biology and support national security.

The standard model of particle physics fails to explain 95% of the universe; the ELTs provide multiple ways to explore dark matter and dark energy.	Cosmic laboratories for chemistry and formation of biomolecules (extreme temperatures and densities)
Spectra of exoplanet atmospheres may help advance understanding origin of life.	Sun-Earth interactions, planetary defense and understanding our place in the universe.


NSF

Potential issues where we could use advice from AAAC.

Regional Innovation – geographic diversity.
Missing Millions - DEI